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AUTHOR Schlafly, Hubert J.
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ABSTRACT

Advances in communications technology could have allowed the United States to develop an integrated telecommunication distribution system, but the manipulation of regulatory precedents prevented the development and marketing of new facilities. The potential of cable television and broad band broadcasters have been thwarted by such restrictions. The future promises both local and national communications networks which provide on-line terminal access to every home, but the attainment of this goal must be preceded by policies which remove regulatory obstacles. (EMH)

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A REVIEW OF THE UNWIRED NATION

Hubert J. Schlafly
TransCommunications Corporation
270 Greenwich Avenue
Greenwich, Conn. 06830

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A REVIEW OF THE UNWIRED NATION

Hubert J. Schlafly

The concept of diversity is the concept of variety in thinking, approach, implementation and benefits. Diversity is characterized by localism, dispersal and competition. In contrast are concepts of singularity typified by nationalism, concentration and monopoly. A wise government policy recognizes both concepts as instruments of public and national interest.

Since World War II the amazing growth of competence and sources of hardware in electronics and other technological disciplines has given both support and credibility to the concept of diversity for telecommunications. The development of new techniques, the need for new services and the lure of new entrepreneurial opportunities challenged established communications facilities and related business planning.

A more open market has already had a salutary effect. When competition threatened, new services, better, more attractive and useful equipments as well as increasing measures to correct service deterioration resulting from an increasing demand, were

hastened. Complaints were taken seriously when customers began to take their business elsewhere in search of better, more immediate and less costly service. It is to the great credit of certain wise individuals in government and in the courts that even to a limited extent people had somewhere to go.

Today, the benefits, capabilities and economies of satellite communications and of local distribution through coaxial cable and (shortly) optical fibers, are capturing the attention of many. Both national and local communications services are being implemented through a proliferation of satellite facilities and services, by the coaxial community networks of cable television (now serving over 10 million homes) and by other local distribution developments and specialized carrier services.

Why then have ten years or more of predictions of the "Wired Nation", the euphanism for a broad scope of communications services, gone unrealized? If we continue to be an Unwired Nation, in the broadband communications sense, it is not because of lack of technology, manufacturing capacity, operational talent or understanding of potential. We are an unwired nation largely because regulatory precedent and other defensive and offensive measures continue to be skillfully employed by a number of established services. This combination is effectively blocking any substantial expansion of revenue productive applications necessary to provide the financial incentives

for development, installation and marketing of new facilities. Some progress is being made, but slowly and painfully. If it becomes a test of endurance, there is little doubt that established singularity will conquer proposed diversity. Even so, since the need and demand is increasing, if we provide sufficient time and money, any of the services will ultimately be developed. The real question, therefore, is not one of IF or HOW but WHEN, by WHOM and at what COST?

The case history of cable television provides a classic example of the battle. Great predictions did not materialize in part because it is easier (and more fun) to conceive an idea than to assume the responsibility for the successful implementation. The major reason is that regulatory and marketing uncertainties increased the financial risk beyond reasonable speculative limitations. The momentum of the growth of cable television, encouraged by some favorable regulation, did give hope in the early 70's that the industry could and would evolve into the broadband communications facility that many visualized. In 1972-73 this momentum was lost. The downward turn of the national economy, loss of aggressive industry leadership and the realization that the hard cash of market acceptance and not a laboratory demonstration or a government agency mandate would justify the necessary plant investment, broke the stride of this fledgling industry. The glow of some favorable policy pronouncements faded. Disillusionment

set in as courtroom and hearing delays and expenses mounted and the administrative procedures to implement policy began to bog down in paperwork and the tangle of precedent and established attitudes.

In the early 70's the cable television industry was touted as the great commercial benefactor that would solve all of our urban and national social problems. It would supply the facilities to correct the ills of education and give voice and view to all the people. Every politician could reach the voters and every citizen or minority cause could be heard or successfully promoted. It would provide city hall and all of the municipal departments with instant knowledge and operational efficiencies; provide funds to balance the city budget and pay the expenses of new federal, state and local agencies. It would magically multiply the effectiveness of doctors and quickly supply accurate information on any subject, to any person at any place. And -- wonder of wonders -- it was to do all of these amazing things immediately and without cost to the public by simply applying the bountiful profits that the CATV operator would realize from the gracious permission of a community to use its city streets for the installation of cable.

Of course, it was believed that there had to be a few protections to prevent this infant from becoming another abusive monster. Regulations, therefore, were designed to limit income; specify what must

and what must not be carried; protect established businesses from the competition of consumer choice, and keep the operators on their toes by introducing an element of uncertainty as to the continuity of their business. When all of this was understood, it did not inspire great confidence in investors and other sources of the tremendous capital necessary to "wire the nation". Instead the investors suddenly lost sight of dividends that would at least equal other opportunities for return, and the banks started to worry about cables' ability to meet a 15 to 20% interest payment on ever-increasing loans.

Nevertheless, the broadcast industry continues to voice its protests. It uses its considerable lobbying power to denounce cable as "pirates" for delivering to the public more and often better signals from broadcast stations that had been licensed for the purpose of making such signals available to the public. It cried about the dangers of competition for programming and for fractionization of television viewing time, while happily announcing increasing viewership and a continuing upward trend in gross and net revenues. But can you imagine the screams we would hear if cable did not carry broadcast station signals, and the public had to use a switch to choose between broadcast programming from a rooftop antenna and cable delivery of non-broadcast programming and other signals.

The gigantic telephone company, whose substantial rate increases

and new market demands are enabling increased stockholder dividends, is more subtle and dignified in its effort to preserve all communications services for itself in accord with its own plant amortization timetable. Here the time proven weapons of regulatory restrictions include delay, uncertainty, lack of precedent and burdensome paperwork. A threatened industry having only $70 billion in assets and over one million employees does manage to submit reams of reports that surely prove any point if only the government had the time, background, and staff to verify and understand what they said. These weapons, plus the cost, delay and restrictions of tariffs and interconnection are much less visible than the broadcasters' screams of rage - but are even more effective.

When the euphoria of happier cable television days vanished about 1973, it was replaced by a pessimism and an attitude that seems to be almost as great an error as the glorious optimism that proceeded. Certainly neither excessive pessimism or optimism is justified. Rather, much hard work and dedication is necessary to provide communications services whose viability must be determined by public acceptance and support and not by scarcity or limitation.

I am confident that the nation will develop both national and local communications networks where every business, every home and every government office will have an interactive terminal which permits access to information and communication services that will have great social and commercial value. My simplistic proof is that there is a

need; there is capability to fill that need at a cost well within public reach, and that therefore, it will happen. And, in our society at least, if a realizable goal truly serves the public interest, can benefit the quality of life in many ways and at the same time develop multiple opportunities for entrepreneurial reward, it has a strength that can overcome all obstacles.

Furthermore -- the people in this country, and probably in several others, are quite capable of absorbing newtechnology and rapidly adapting to new services. Public participation has progressed at an increasing pace ever since the start of World War II. We as a people accept, and to a large measure understand, television, moon walks, deep space probes, computers, credit card billing, sidewalk banking and other uses of technological sophistication. In a few short years the wizardry of the electronic calculator has been transformed from an expensive instrument of the elite into a consumer product commanding full page ads by Macy's and Gimbel's. Here is a case where even a modest need by just a selective portion of the public stimulated a competitive application of sophisticated technology to develop a mass market product with a popular price tag. In much the same manner, perhaps even more explosively, I expect that there will be a public awareness of benefits of broadband communications networks. One or two demonstrable success stories will catch the imagination of the public, the press, entrepreneurs and businessmen alike in a way

that none of the "blue sky" merchants and visionaries succeeded in doing. Then demand will spread across the nation. The shortage of hardware, trained personnel, and the physical delays of installation will bring far more criticism than all the abuse of today's doubters. Politicians will examine their records for quotations where they predicted good things for broadband communications and will begin to chastise an industry that took such a long time to implement a service that everyone knows has such obvious public benefit.

But when? When will that trigger reaction take place? Well, unless and until there is far more hard work, dedicated belief that these things can and will happen, and a willingness to encourage the energy and funding necessary to create physical facilities, it may take a long, long time before my predictions will be fact.

But if the goal is clear, the ingredients are understood and the dedication is high - we can systematically unblock the barriers and hasten the day. Government agencies and policy makers can be of invaluable assistance. We need a positive "can do" attitude to replace the negative thinking of "what if". We recognize that in any development, particularly in any profit motivated enterprise or opportunity, there is a chance of abuse. I am sure that expansion of telecommunications services through private enterprise is no exception. Open competition is protection. Careful monitoring by public and government agencies, national and local, which detect and then correct abusive trends or

out and out violations of law, is a protection. One way to prevent abuse is to prohibit use. We could prevent bank robberies if we allowed no banks. But protection by prohibition, direct or indirect, by policy or by de facto regulation inconsistant with policy, prevents any potential for benefit along with any threat of ill. Before the fact countermeasures is a subterfuge of status quo. It has no place in an expanding society.

With regard to the expansion of telecommunications services, there seems to be only begrudging and painful encouragement of economically viable projects that do not need a continuation of government or foundation funding to succeed. On the contrary, commercial viability of any service which would encourage the establishment of facilities necessary to accommodate continuity and practicality of successful experiments, was considered a threat to established businesses. This threat, in some way, is interpreted as a violation of the public interest because it is asserted that irreplaceable and vital services would be immediately and forever destroyed. The creation of a new facility or service even though its commercial success depends on public acceptance and support, must therefore be suppressed. Some attempt to have it killed by legislation, others employ strangulation in the hope that it will dangle, turning slowly in the wind.

I propose that this convocation of knowledgeable and practical telecommunications policymakers support the concept of diversity of services and facilities by positive encouragement of competition.

This requires more than a statement of policy - it requires a back off from a habit of restriction so that new policy can be implemented and that new services will have an opportunity to prove their worth. If these services have value and are accepted, they will thrive and the public will benefit; if they have no value or improvement over available facilities, they will disappear and the public will not be harmed; if they violate the law, they must be brought to justice and the public will be protected.

Many government agencies and services that have proposed broadband communications experiments - and that includes education, welfare, medicine, justice, transportation, security, commerce and many others - have often been stymied because no operating systems are available or are willing to make a major financial commitment to test a limited or, in their minds, an uneconomic objective. I urge you to support any economically viable use of communications networks - even for services not directly related to your prime interests - so that there will be increasing facilities capable of implementing your specific goals. While you may not in the past have been successful in persuading someone to level the mountains, fill in the valleys and make the way straight just so you can bring your goods to market, if enough people find productive use for such a highway, you may get your produce to market sooner than you think.

What are we talking about? Primarily we are contemplating a modern telecommunications system which interconnects the public, in their homes, with sources of information, entertainment and services and which allows individual attention or interaction with local or remote entities on substantially a real time basis. True, many of these services could be satisfied by a narrow band, low speed, central station switched system such as the present telephone network. But if you are considering really large numbers of terminals, fail safe monitoring, real time capability and direct computer compatibility, a broadband network is essential.

You can see that this service is far more comprehensive than CATV or Cable Television. It involves a great complex of technologic disciplines: Computer processing, memory, and accessing; digital signal handling and techniques; multiplexing; terminal addressing; bi-directional transmission; security and privacy considerations; and a great variety of auxiliary or peripheral equipments for information display, input, sensing, storage and process initiation; interconnection with satellite and other microwave facilities; and of course a vast assembly of both video and computer software and courseware.

We are talking about a whole new level or plateau of communications that will enable us to apply the efficiencies and benefits of electronics to the routine life patterns of the people and in many cases ease their

problems, vastly increase their opportunities, supply convenient access and service, save their time -- and, I truly believe, save money for both the people and the government.

Is there a need for such improved communications? I could give you many studies for reference, the most pertinent here is the report of the National Academy of Engineering Committee on Telecommunications.

We are living in an increasingly complex society where the numbers, age groups, concentrations, intelligence levels and job requirements of the people have effectively obsoleted many of the previous ways of doing things. The need for wider distribution of knowledge forced the printing press to replace handwritten copies; the need for more and better cloth forced the mill to replace hand weaving; the needs of more distant, faster and greater capacity for deliveries, forced development of the locomotive and the steam vessel. Today we have a need for faster, more accurate, lower cost, non-polluting, energy-conserving methods of transferring information and consummating transactions for vast numbers of people. The doctor doesn't make house calls, the elderly and feeble don't risk the physical and criminal dangers of the street, the shopper clogs the highway and the parking lot in a search for information and product; the businessman curses the delays in making an error-free reservation and the delivery of a piece of paper which displays a ticket or confirmation, the investor lacks knowledge on his personal portfolio of stocks, the welfare recipient and the senior citizen spend frustrating, confusing and dehumanizing hours locating and

seeking direction and information exchange from a harrassed and overloaded social worker; the rural or village resident crowds to the city because his more pleasant, healthy and relaxed surroundings lack conveniences, opportunities, access to culture and communication with a wider variety of talents. This list could be endless. Each of us could easily add items from our own personal or professional experiences. Is there a need for relief from these inherent ills of an increasingly populous and complex civilization? There is need for such relief.

But "need" per se means little if there is not a capability of satisfying that need. One of the reasons for the sad state of the cable industry today is that municipal fathers and educators, for example, recognizing their need, made impossible demands as part of franchise conditions. Cable operators too, listened to the siren songs of the blue sky and made impossible promises in the heat of competitive franchise fights. And professionals, including myself, aware that the technology was available, that implementation rather than invention was all that was required, leapfrogged the mundane problems of doing and financing -- and painted the glorious pictures that encouraged others to make their mistakes.

There is no question that the state-of-the-art is adequate. The technology of the disciplines that I mentioned earlier is developed. The ingredients are in use today -- perhaps in different formats and different settings. But them the same can be said about building a brick wall. The ingredients are available -- the bricks, the cement,

the sand and water; trucks are available to transport the material, tools are at hand and the labor supply is good. It still takes time and effort, planning and money to complete the structure. Even a small model change in a commercial television receiver may take two to three years between concept and factory production. Why then do we expect that such a massive effort as will be required to establish a new national telecommunication facility can be a spur-of-the-moment project, organized and developed by an industry that has just emerged from its "mom and dad" phase -- surrounded by restrictions, legalities, and other threats to its very existence, not to mention its development and expansion.

I, for one, believed that the cable industry was developing professionally and emotionally and that it did have the momentum and financial promise necessary to reach a peak of achievement. The subscriber base seemed to have grown large enough to support local origination; learned studies of the Rand Corporation, Mitre, Stanford Research, A. D. Little, Slone Foundation, EIA, NAE and others were all encouraging; the press (perhaps unduly) whipped up excitement; support and encouragement was beginning to develop in government -- including favorable rulings by the Supreme Court and opinions from the Justice Department. The FCC, after a most intensive study, brought stability through its 1972 Rules and Regulations that recognized expansion and helped to deter some of the local regulatory abuses and curb irresponsibility of some of the operators. The Telecommunications

advisors to President Johnson and subsequently the OTP studies on cable, although laced with skepticism, seemed to support the belief that the public interest could be served and that competitive ingenuity could be healthy; the National Science Foundation has funded studies and demonstratable systems, generally with specific objectives and without commercial overtones; HEW and the National Library of Medicine pushed the Mt. Sinai Hospital and other projects. The telephone company, until recently, was too occupied with problems of providing basic telephone service to conduct overt and unpopular opposition (even though I suspect that tactics they may have adopted proved very effective). Most important, the investors and financial community provided enthusiastic support.

It was also encouraging that the "biggies" in electronic engineering and manufacturing were persuaded to examine the field and indeed to invest money in hardware and system development. Hughes Aircraft, RCA, Magnavoc, General Instruments, Scientific Atlanta, actively -- -- -- General Electric, IBM and AMP quietly. And many smaller companies -- Tocom, EIE, Coaxial Communications, Vicom (now Interactive Inc.) Repco, -- as well as component manufacturers, showed definite interest. Bi-directional transmission tests and the healthy discovery of many new operational problems, began to flourish. Los Gatos, El Segundo, Overland Park, Jonathan City, Columbus, Ohio, Reston, Virginia, Orlando and others were field laboratories which exposed realities and offered opportunities for solving problems and developing techniques.

With all these things going for us, I felt confident that the cable industry and the electronic industry, with the cooperation of the government, could quickly develop the necessary ingredients to trigger that critical mass that I predict will turn that blue sky into the green grass of social and commercial benefit.

My own objective was not manufacture of a profitable item of hardware, that was the carrot held out for others, but the development of the essential tools, having the price bracket, reliability, human engineering and manufacturing design ncessary for mass market, consumer product system use. This technique had been successful in developing the multi-channel microwave system that the Commission finally approved for Local Distribution Service. This short-range, spectrum conservative means of multiple addressee distribution is a successful and valuable piece of hardware that overcomes many of the right-of-way, signal quality, maintenance and economic problems of adjacent community interconnection or multiple hub distribution techniques.

I recall that the potential of Subscriber Response services began to attract attention back in 1958 during the development of the Management Information Control system for the Army Missile Command at Redstone Arsenal. In 1960 "audience participation" was featured by "Key TV" -- a slow and primative data collection system using balanced pairs, sequential polling, limited response alternatives and a punched paper tape readout. In the late 60's, Ed McCormick, who is now operating the Jonathan City two-way system and Dr. Hal Katz of Vicom, among others,

helped demonstrate the importance of the explosive advances in computer and microelectronic technology for this application. These developments made possible realization of the functions, time cycles, simplicity and price category necessary to predict a practical home terminal system. As the 70's progressed, clouds began to gather on the cable industry horizon. But the seeds of interest had been planted and appeared to be flourishing. Many, independently, or perhaps by mutual stimulation began investigating the field. Most of these characteristically researched the market seeking out and interviewing operators and potential users who seemed active in the field. But how do you market research something the public doesn't know or, as yet understand?

As developments progressed, it became apparent that the larger companies generally possessed many advantages but lacked an essential ingredient. Engineers attracted to broadband communications were not consumer product oriented. The digital, computer and transmission experts who had been dealing in military, big government and big industry contracts did not understand consumer market pricing and manufacturing. Cost reduction ingenuity and minor performance tradeoffs were not practiced, at least not to the extent necessary. Experienced mass production engineering was not called in and cost efficiencies in manpower, facilities and field testing were not properly controlled. Consequently, costs rose, budget director grumbled, profit center managers who correctly anticipated no immediate return on investment looked for the first belt tightening opportunity to duck out. Some of the smaller companies did not have that problem. They practice economy operation but they do not have the capital necessary for sustained development without product income.

There was another important factor -- market surveys and market test planning took priority over technical performance, design simplification and engineering refinements. This meant that skeptical interest exceeded the capabilities of the product. Promises made could not be fulfilled, or if fulfilled, were done at a cost and effort that made continuation impractical. Disillusionment was followed by lagging interest.

I believe that one of the major reasons for the decline of cable enthusiasm was the fact that the cable companies did not -- or were successfully prevented from establishing new sources of revenue with which to sustain development and expansion. The costs mounted as inflation developed. Material and labor prices increased; municipal, state and federal taxes and franchise fees taken "off the top" cut deeply; and the promises of "free" service and expensive facility installations began to catch up with the operators. This may have been alright if the promise of new revenue had developed but the industry still had its Mom and Dad income while trying to imitate a Ford Foundation beneficence. In other words, the industry did not demonstrate a rate of revenue growth necessary to sustain its need for developing facilities. Cash flow began to go negative.

Yes, there were (and are) ways that revenue could have been increased. Advertising revenue was not effectively developed -- did not even sustain the local origination expenses. Cable networking was costly. Even bicycling of video tapes had many hidden costs. It lacked ease of control and satisfactory viewer quality. Pay TV was stalled as much by undeveloped technology (ala the experience of hotel

system promoters) and by lack of coordinated industry planning as it was by competitive opposition. Security services -- and if there ever was a service whose time was now, this is it -- have not developed. Rate increase efforts were late in getting started. These are a few examples of where foresight and work-a-day dedication could have made a difference.

Then the regulatory uncertainties played a major factor. One thunderbolt after another was hurled from Olympian heights -- meaning that increasing amounts of resources and the time and effort of the more knowledgeable cable operators was spent in countermeasures. Lawyers' fees, consultants' fees, public relations' fees mounted.

Expected support did not develop -- no designated or cable dedicated government agency took a lead position. Even the publicized Technology Advisor to the President/dropped cable as soon as mass media support for an election year took priority. in 1972

One of the most aggressive and talented leaders of the industry was effectively mouse trapped (assisted by his own series of mistakes) and removed from the scene. The successful and growing organization he had built was first shaken by internal strife and now is a frightened and introverted follower rather than an industry leader.

Is it any wonder that as soon as inflation, interest rates, public confidence in the economy and national and international crisis threatened, the banks and the investors lowered the boom?

In the cable industry the "bean-counters" have (only temporarily, I hope) taken over; aggressive development has been set aside. What is more disturbing, the major electronic firms -- fearing no immediate need for new cable products and perhaps licking other wounds, have diverted development. Hughes shut down the El Segundo tests, pigeonholed SRS development; RCA is seeking to sell off EIE; Magnavox dispersed and reassigned its MRL team and negotiated for an off-shore ownership.

That's a pretty black picture. But if the industry has been dragged down into the depths -- the Valley Forge of cable as David Foster of NCTA once put it -- now is the time to start climbing back up that hill. The essential ingredients are still there -- the need -- the capability -- the economic justification. And the picture is not all bad -- there are some bright spots -- many bright spots. I could not be more confident that it will happen. And I predict that when it does happen, the major public and political criticism will not be "Who needs it," but "What took you so long?" When it happens, it may not be the cable operators who take the lead -- but it will be someone -- perhaps some new entity.

It is obvious now that Broadband Communications will not be an overnight miracle, it will take hard, dedicated work -- a well-planned series of minor advances. It seems unlikely that it could become an official national goal (although that could happen, if the right man or agency in government pushed hard enough). Instead of a full-scale war

it will be a series of infiltrations -- until the outcome is obvious and the explosion I predicted earlier, will be triggered. The public, if its interest is to be served, needs help in understanding and evaluating the worth of broadband communications. We all have got to believe -- be watchful for decisions or implementations that will help the trend -- continue to develop special uses which could be implemented by the wired nation but, more important, push for breakthrough applications in any field. We must seek coordination of effort and useful joint ventures. Even if government does not promote, it certainly should not hinder, anything that could be a helpful ingredient.

There are many areas where progress has been made:

- Improvements in hardwire technology, frequency division multiplexing, amplifier and cable design has developed greatly -- stimulated by the installation of thousands of miles of cable television trunk and feeder plant. It is estimated that over 200,000 miles of cable plant are now operational in the United States. Multiply this by bandwidth and you have an equivalent of 5 billion miles of telephone voice circuits.

- The fascinating field of fiber optics has great potential and is totally compatible with the broadband concept. Even now it could help solve the upstream additive RFI problem of bi-directional transmission if the industry would share the knowledge of the Naval Research Lab or others working in this field.

- Techniques for wiring multi-dwelling buildings and more economical methods of installing and protecting underground cable plant and equipment, have been developed.

- Lower cost and higher quality television studio equipment has been greatly encouraged by the potential of the local origination market. Individual and group access to the public through low budget, specialized interest programming is fully feasible.

- Hardware and multiple techniques to implement viewer-sponsored programming or special interest-supported communication is developed and is being evaluated. Regulatory restriction on what has been diversely called "pay TV" were relaxed just enough to warrant further expenditures in this field and a true test of public reaction.

- Local distribution microwave and "express cable" installations are permitting larger service areas and interconnection of adjacent systems.

- The Domestic Communications Satellite is now a reality, capable of serving all of Canada and the United States. The transportable earth receive station experiments (FCC File 1-DSE-(R)-P-73) clearly demonstrated the flexibility, reliability, excellent quality and low cost of this type of national networking. Suddenly every community or rural area has access to national telecommunications services at reasonable cost, using practical hardware. In September of 1975, Time Inc., through its subsidiary Home Box Office, "bit the bullet" and has now committed some 9 million dollars in a contract for satellite transponder time for its subscriber sponsored programming services. That encouraged private operators to invest in earth station hardware so that today, barely 6 months later, there are some 26 operating earth stations

supported by commercially viable communications traffic. A year from today - unless the common carrier bureau accepts the Telephone Company anti-proliferation premise, there will be over 100 operating stations.

- Continued rapid improvements and cost reductions in large-scale integrated circuits bring price and performance of home communications terminals closer and closer to consumer product design and pocketbooks.

- The computer industry now has no doubt that it can provide, in practical configurations and at reasonable cost, the memory capacity, processing capability and speed necessary to provide information access and services as needed for a mass user market.

- High-speed delivery of digital signals has been successfully tested via a combination of domestic satellite and a standard operating cable system, without a single error detected in over two billion bits of information. It is interesting that one second of data transmitted at the rate used in this test is equivalent to about 3 1/2 hours of speaking time.

- Bi-directional systems are in productive use, primarily by cable systems themselves for performance and status monitoring of plant operation. Coaxial Scientific, a small electronics firm has been operating a simplified low cost bi-directional system installed in 1,000 homes in Columbus, Ohio, for over a year. Big industry, primarily the motor industry, is using bi-directional coaxial closed circuits with subscriber type data terminals and computer control for multiple production line stations, for automatic inventory control, rate of flow sensing, utility performance, instructional information to workers,

trouble reporting and emergency alarm. Industry is using broadband communications, not because of futuristic plans for a national network, but because it does today's job cheaper, faster and more effectively than other communications systems.

- The National Science Foundation has selected a number of cities and teams of cable operators, researchers and community groups, to test a variety of public service uses of interactive cable.

- A low cost ($100 range), high speed (30 words per second), consumer engineered (small, no moving parts, quiet, no chemicals or powders) hard copy printer, has been developed for home use. This could be an immediate solution to individual home storage of information or electronic delivery of messages. Since this printer accommodates handwriting, business forms, and line drawings as well as alpha-numerics, it could be a means of breaking open a national home delivery method -- perhaps a special and profitable new class of service for the U.S. Mail.

This review of progress could include many other items. It could speak of the activity of the Electronics Industry Association whose committees on Satellites, Broadband Communications and Consumer Products meet frequently and whose Engineering Bulletin on a Cable Compatible television receiver has been published. You know of the work of the Cable Television Technical Advisory Committee whose final report to the FCC was released in April 1975. More recently the Institute of Electronic and Electrical Engineers has combined working groups into a new Cable, Broadcast and Consumer Products Section. A full review

would include current considerations at OTP, FCC and in Congress -- many of which are favorable to the growth of broadband communications.

I truly believe that the goals of government agencies can be well served by the broadband concept for a national system which communicates with individuals in their home environment. I am sure that such support is not only in the public interest but also the government as a consumer of communications services, is concerned with lower cost and more effective methods. I am confident that it will happen -- how soon and whether the United States will be the leader or a follower of the rest of the world, depends upon the dedication of those who have been privileged to have a foresight of the benefits. Or can we be deterred by those whose narrow goals and short-term objectives confuse or distort the picture at the policy-making levels of government and industry?

- End -